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**Astronuclear
Laboratory**

INFORMATION CATEGORY.

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From: Engineering Mechanics

Date: January 8, 1968

Subject: Room Temperature Load Test

ASTRONUCLEAR LABORATORY

TO: C. L. Neuche, Manager
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In order to get early information concerning the gas sealing ability of the pyrofoil washers proposed for the PF-1000 cluster support design, a test was run with some partially simulated components in advance of the receipt of all the reactor grade material. The regular protection cup, pyrofoils, pedestal, tapered washer and outer sleeve were used; but a pyro-washer was substituted for the insulating cup and a steel tube for the inner protection sleeve around the tie rod. A steel plate was used to simulate the interaction of the fuel elements with the pedestal.

A fitting was designed which could pressurize the protection cup area above the pyrofoils while subjecting the assembly to loading at room temperature in the Wiedemann machine. A load of 350 lbs. was used and a gas pressure of Helium at ten (10) psig.

Eight (8) runs were made with as many sets of pyrofoil washers; only in one case six (6) pyrofoils, and in another case, seven (7) pyrofoils were used instead of the design number of eight (8). In all but one run, the seal was gas tight at ten (10) psig insofar as no flow could be measured on a flowmeter and the pressure could be maintained for an hour without measurable drop. An investigation into the case where leakage developed revealed two (2) of the pyrofoils got torn in sliding them over the steel tube which they were sealing to. Otherwise, it made no difference whether there were six (6) or eight (8) foils or how randomly they were bunched together.

MASTER

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In still another variation, the outer sleeve was shimmed away from the pyrofoils a distance of ten (10) mils. Under loading, this gap was filled in nicely and the seal was just as efficient. Even under twenty (20) psi of pressure differential, no leakage developed. Without loading on the assembly, only five (5) psi of pressure could be held across the seal and by means of leak detector fluid it was established that the leak was through the larger diameter pyrofoil layers and up the sides of the protection cup.

From the foregoing, it can be established that the pyrofoil washers perform very adequately as a seal at room temperature under single or repeated loadings. Care must be exercised during assembly to avoid tearing either of the face washers which are in contact with the sealing surface. Otherwise, no special precautions are necessary. The substitution of a steel tube for a graphite one is not believed to make any difference except for the permeability of the graphite. It is planned to repeat the test with a larger than ten (10) mil gap to the sealing edge of the outer sleeve, but the purpose will be more to determine the maximum molding ability of the pyrofoils rather than directly relating to reactor assembly.

It is additionally planned to run a hot seal test of pyrofoils using all graphite parts and an auxiliary fixture is under design to accomplish this. From past experience in the use of pyrofoils to seal test fixturing, there is no reason to believe that the sealing efficiency will be degraded; but once the material has baked and set, it is necessary to determine whether repeated loadings and temperature cycles will lead to a poorer performance.

For purposes of record, the serial numbers of the parts used in this test are as follows:

Pedestal	LB3863-3P
Tapered Washer	LB3863-TW
Cup	LB3871-3C
Sleeve	#2

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